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NOTES ON THE BREEDING HABITS OF *PHRYNOSOMA*
CORNUTUM AND OTHER TEXAS LIZARDS.

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Our knowledge concerning the breeding habits of the lizards of the genus *Phrynosoma* is rather limited. The majority of our herpetologists have either been so situated that they could not study these animals in their natural surroundings or have been satisfied to accept the oft-repeated statement that all horned lizards produce living young. As a natural result, there are many naturalists who are not aware that *Phrynosoma* as well as *Sceloporus*, contains both oviparous and viviparous species. In the genus *Sceloporus*, only one species (*S. viviparus* Cope)* is certainly known to produce living young while all of the others are supposed to lay eggs. In *Phrynosoma*, the case is exactly reversed and only one species is known to be oviparous. This is the very common Texas horned lizard (*Phrynosoma cornutum* Harlan), and after a very careful survey of the literature on the subject, I believe that I am the first writer to call attention to this fact.†

In the writings of Cope, Boulenger, Lydekker, and others, it is stated that the lizards of the genus *Phrynosoma* and one species of *Sceloporus* are the only iguanoids that are known to be viviparous. Mr. Raymond L. Ditmars, in his excellent work‡ speaks of the viviparity of the horned lizards, and states that the young usually number from 6 to 12. On plate 39 he shows a photo of two young examples of *Phrynosoma d. hernandesi* only two hours old.

My friend, Mr. C. M. Barber of the Field Museum of Natural History, recently referred me to Mr. C. C. Adams of the Uni-

* E. D. Cope, Rept. U. S. Natl. Museum 1898, p. 332.

† Strecker, Proc. Biol. Soc. Wash. 1908, p. 72-3.

‡ The Reptile Book, New York, 1907, p. 141.

versity of Chicago for information regarding a female horned lizard that gave birth to young while in captivity. I wrote to Mr. Adams and he sent my letter to A. G. Ruthven, Curator of the Museum of the University of Michigan, who answered it as follows:

“Mr. Adams, of the University of Chicago, has forwarded to me your letter of April 20 in regard to the horned toad. This specimen is in our Museum here. It is a large example of *P. hernandesi* and was taken in the Grand Canon of Colorado, near Bright Angel Trail, on July 10, 1904. It was sent here alive and on July 29, gave birth to 13 young. I am surprised that you find that *P. cornutum* is oviparous. I was under the impression that all the lizards of this genus gave birth to their young alive.”

P. cornutum is the only species whose habits I have had an opportunity to study thoroughly, and since the publication of my brief notes on this lizard I have received letters from a number of naturalists who express their surprise to learn of its egg-laying habit. The two sets of eggs mentioned in my notes were described simply to show the difference in the habits of the animal under different circumstances. In both cases the nests were discovered while the females were at work. These sets were merely two out of the dozen or more that have passed through my hands, and in every instance but one the eggs were twenty-four in number. A female, together with her eggs, has been preserved in the University collection for a number of years. The collector, a Baptist minister, informs me that when he first discovered the nest, the lizard was in the act of depositing the eggs and paid no attention to him, although he watched her for several minutes. He then left, and on his return an hour later, found her at work filling up the hole.

The usual site selected for the nesting burrow is the base of a slanting bank of earth or sand. The hole seldom goes straight down, but is usually dug at an angle of about 45 degrees. The animal's fore-feet are used in digging while the hind-feet assist in pushing the earth out of the burrow. As soon as one layer of eggs has been deposited the lizard fills in around and over them with earth and is ready for the next lot. In one nest examined by me, the eggs were arranged in four layers of six each. It is really marvelous how hard and firm the earth is packed into the burrow. The period of incubation is about forty

days, but I presume that this depends largely on the condition of the weather and the location of the nest. Several eggs hatched out in my office on the 35th day, but I am certain that these were several days incubated when they were brought in. In my former notes I mention a set of eggs that were found under an old railroad tie. This seems rather a peculiar case when we consider the fact that the eggs are usually buried to a depth of six or seven inches, but at the time this set was found it had been raining steadily for several days and the ground was wet and soggy. These conditions may account for the seeming neglect of the lizard mother. Had I not captured the female, I might have at first thought that these eggs were those of some other lizard. At that date, however, *Cnemidophorus gularis* was not breeding, in fact had only been active for a very few days, and it is the only other species that would be likely to breed in such a situation. As far as my observations go, none of our other lizards deposit more than a dozen eggs, and there were twenty-four in the set mentioned.

The breeding season extends from the middle of April into the latter part of July. The eggs have a tough, leathery, non-calcareous shell. All of those in one set are usually of the same shape, but when several sets are compared they show considerable variation. The length in about seventy specimens is about the same, but the diameter varies considerably. The average type measures $\frac{2}{3}$ of an inch in length by $\frac{7}{16}$ in diameter. In the fresh egg the color is yellowish-white. Those in the set collected on July 10, 1906, are almost black as they were buried in a bank composed largely of coal dust and cinders.

When first hatched the young are smooth and tender, but in a short time are very active in their movements and fully able to take care of themselves. They do not receive any care from the mother, who probably never returns to the spot where she buries the eggs.

This species, in common with other members of the genus, has the habit of occasionally squirting blood from the corner of the eye. This is only done when the animal has been injured by rough handling. One afternoon I collected twenty-three specimens, and when I was ready to start home my shirt looked as though I had been present at a hog-killing. Judging from my experience I would say that this habit was more common with

our species than with any of the others. An old superstition among the country people and negroes, is to the effect that when a horned toad "spits" blood, its bite is "suah" death.

Some years ago a friend brought me a dead hawk (*Buteo lineatus alleni*) that he had found lying out on the prairie west of the city. It was greatly emaciated and there was considerable dry blood on the feathers of the throat and breast. On skinning it I found no shot wounds, but when I made a careful examination of the carcass I found that it had swallowed two horned lizards and that one of the occipital horns of one of these had penetrated the bird's trachea.

The breeding habits of *Sceloporus spinosus* Wiegmann are subject to considerable variation. I have found five sets of the eggs of this species and a detailed description of the location of each one may not be amiss.

Set A. In a timbered tract where fallen trees were scarce. The four eggs were buried in the hard ground in a level space near the foot of a large oak tree. Depth of hole, 5 inches. When discovered the female had almost finished filling the hole, and was using her fore-feet to press the earth down.

Sets B and C were deposited in small hollows scooped out under the ends of fallen trees. Both hollows were very shallow and the eggs were less than an inch below the surface of the ground. Female lizards present in both cases. Sets of eight eggs each.

Set D (eight eggs) was under the loose bark of a fallen tree, while set E (four eggs) was found in a hollow rotten log.

These sets were all found in districts where no other species of tree lizard occurs. In my experience, I have always found the female *Sceloporus* near her eggs, and I have every reason to believe that she cares for the young for some time after they are hatched.

The female *Cnemidophorus gularis* usually scoops out a shallow hollow in the sand and deposits her eggs to a depth of only an inch or two, but on the grassy flats where there is no sand I have found them buried in the soft earth at the foot of a mesquite tree, to a depth of four or five inches. The eggs of this species are from 8 to 12 in number. The following is a detailed color description of an adult male specimen of *Cnemidophorus gularis* during the breeding season:

Top of head, dark olive green; spaces on sides of head from nostril to eye, light blue. Ground color of back, rich, dark brown; light stripes (with the exception of the two lower ones which are light green) yellowish green; spots in the dark interspaces, buffy yellow. The sides present a barred and mottled appearance as in some examples of *C. tessellatus*, the colors being dark brown and light green. Base of tail, salmon; along median line, olive green; the stripes along the sides of the tail are buff, bordered below by a narrow blue line. Upper surfaces of fore-limbs, blackish brown mottled with buff. Hind-limbs, clove brown marbled with buff. Underside of head and throat, pink. Underparts from throat almost to vent, dark blue. A patch of blue-black between the fore-limbs. A few white scales on the sides of the belly giving it a mottled appearance as seen from the side. A blue line along the inner surfaces of the fore-limbs. Under surfaces of tail and limbs, bluish-white. Total length $10\frac{1}{2}$ in. Length to vent $3\frac{7}{8}$ in., 16 femoral pores. Locality, Waco, Texas.

Ditmars has published an interesting account of the breeding habits of *Eumeces quinquelineatus* L. and I can verify all of his statements excepting in regard to the number of eggs of this species, which he says are 3 or 4. The several sets that I have found were all of 8 eggs each.

Some of our specimens of this species retain the young type of coloration when they are almost full-grown. I have a male specimen with a length of head and body of nearly four inches, that has the usual red head, but the rest of the body is colored as is the "*fasciatus*" type.

While I was working in Burnet County, Texas, two years ago, I collected a number of examples of the rare and interesting short-lined skink (*Eumeces brevilineatus* Cope). In tearing up an old log I found a female of this species and four small oval eggs about 13 mm. in length. I can not be positive that these eggs belonged to this lizard as they were accidentally crushed in the collecting can, so that I could not save them to hatch, but I am pretty sure of it, from their resemblance to those of *quinquelineatus*.

The eggs of *Leiolepisma laterale* Say are 3 or 4 in number and are deposited under the bark of fallen trees or in hollow logs. They measure about 9 or 10 mm. in length.